Clinical Thermometry and the Management of ‘body temperature’ in Humans.

By John Zeal

Introduction.

The effects of a fever on people generally have been known for centuries, in fact there are no less than five references to fever mentioned in The Holy Bible, it can therefore be stated reliably that human body temperature has been known and associated with illness over thousands of years. However, the means to measure body temperature is attributed to Galileo (1564-1642) as being the person who invented the clinical thermometer, though his device would not be recognisable by to-day’s products.

It is not intended to outline the history of Clinical Thermometry here, interesting as it is, but instead to identify the texts of published Papers (1, 2, 3, 4, 5) for the benefit of researchers in this subject.

The content of this CD-ROM concentrates quite deliberately on those devices that can be most easily used in countries of the ‘disadvantaged world’ where accuracy, reliability, ease of use and reading, together with safety and cost-effectiveness, are essential considerations. It is not intended to include any type of electronic clinical thermometer with a remote reading electronic probe (6) or the infrared ear canal (tympanic) thermometer (7, 8), owing to their high cost of purchase, regular maintenance and re-calibration, their need for expensive single-use probe covers and replacement batteries; nor is the Tempa-DOT Single-Use Clinical Thermometer (9) included owing to this device being unsuitable for use in high ambient temperature conditions.

The devices selected and illustrated include the following types:

1. The conventional glass/mercury clinical thermometer.
2. The ZEAL Single-use Thermometer.
3. The ThermoSpot – Non-invasive hypothermia indicator.

Before outlining these four specially selected devices in some detail there are a number of common factors applicable to taking body temperatures generally that should be noted carefully, these are as follows;

1. The British Medical Association (BMA) recommends that the ‘normal’ deep-body temperature is 37.0°C (98.6°F) (10, 11). Whilst this value is the generally recognised ‘normal’ temperature it should be emphasised that it is the ‘average’ temperature of deep body tissue for most healthy people at rest in a neutral temperature environment.

2. Circadian rhythms (12) are a feature to be considered in the taking of body temperature, however, the ‘temperature rhythm’ is recognised as one of the more stable rhythms in humans. Nevertheless, the diurnal rhythm variation can result in a difference of at least 1.0°C depending upon the time of day or night when a temperature is taken. The time of day when the body temperature is likely to reproduce the most accurate and constant reading is between 12 noon and 6:00 pm. Another reason for an increase in body temperature apart from fever is during and immediately following strenuous exercise.

3. The Oral cavity (under the tongue) (12) is the most frequently used and convenient site especially where adults are concerned, however, children 10 years old and over can use the conventional glass/mercury instrument provided they are properly supervised. The positioning of the thermometer’s sensor is very important, see diagram, since significant temperature variations can occur if the sensor is misplaced. Throughout the period of taking an Oral temperature the patient must keep their mouth closed and breath normally through the nose, furthermore, the patient should also refrain from talking. It is also important that no hot or cold fluids, foods be taken or smoking should be permitted for at least 20 minutes prior to taking an Oral temperature.

4. The Axilla (under the arm) (10, 13) is the next most commonly used site, especially where newborns, infants and
children up to 10 years of age are concerned where the conventional glass/mercury instrument is used. This site is considered the safest out of the three most commonly selected (Oral, Rectum or Axilla) but is the least accurate where the conventional glass/mercury instrument is concerned. *(See additional information in Item 2: Instructions for Use – Axilla).*

5. The Rectum (through the Anal Canal) (12,13) is the most inconvenient and potentially hazardous site for recording body temperature, however, it is considered to be the most accurate for in identifying *core temperature* though the slowest to detect any changes from previous readings. This site has hitherto proved advantageous for newborns and infants but great care and experience is required to correctly insert the thermometer’s sensor without damaging or piercing the Anal Canal wall tissue, also to the correct depth as appropriate to the age and size of the newborn or infant. As a consequence use of the Rectum is only selected when either of the other two are not available. It is also now considered as representing an assault on a newborn, infant or child where, for quite obvious reasons, they are unable to give permission to the doctor or nurse to use this site or suggest an alternative site.

6. There are two further sites available where the ThermoSpot is the chosen device, namely the Hypochondrium (above the liver) and the Supraclavicular Fossa (above the great blood vessels of the neck) but these will be explained under the heading of ThermoSpot – a non-invasive hypothermia indicator. *(The Tympanic Membrane is not listed as another suitable site since this type of electronic ‘aural canal’ thermometer is not recommended for use within the disadvantaged world).*

1. **The conventional glass/mercury clinical thermometer.**

   i) **Standard Range:** 35/42°C or 95/110°F.  
   *(For Oral & Axillary use).*
   Accuracy Tolerances: -0:1°, +0:15°C
   -0:2°, +0:3°F
   CE Registration No: 0086.

   This instrument is by far the most universally established and accepted device to measure body temperature since it was introduced in 1886/1887 (5). As it was the first reasonably accurate clinical thermometer to be invented, Professors and Doctors began to research and publish papers on aspects of *fever* hitherto unknown from using this quite new instrument. Initially, these early clinical thermometers were round in shape, fragile and very difficult to read, especially in poor light, since there was no magnification (lens) facility incorporated to improve the visibility of the mercury column. The change in shape to incorporate a lens front for easier reading of the mercury column inside did not occur for some years later and came about by chance.

   The Fahrenheit Scale was the then accepted temperature scale throughout the UK and the Commonwealth; 98:4°F became the recognised ‘normal’ for a healthy person. It was not until the 1960’s that the Celsius Scale was introduced into all UK NHS hospitals as part of the adoption of the Metric System when the Nation joined the EEC; 37:0°C (98.6°F) was identified as the equivalent ‘normal’ body temperature. The Fahrenheit Scale is no longer officially recognised in the UK.

   ![Thermometer Image](image)

   i) **Range 94/110°F**

   ![Thermometer Image](image)

   ii) **Range 35/42°C**

   During the early years of development the quality and accuracy of all glass/mercury clinical thermometers will have been ‘suspect’ owing to the poor quality of materials available. It was not until a British Standard was formulated and published (BS 691- Clinical Maximum Thermometers) around 1921 that the manufacturers began to improve their own standards of quality and accuracy. It is essential for ‘users’ that they purchase glass/mercury clinical thermometers made to an ‘internationally’ known and accepted Standard, such as a British (BS), European(EC) or NBS (National
Bureau of Standards, US) Specification to ensure the best quality of materials and products available. **GHZeal Ltd, London SW19 3UU, UK.** is a reliable source of supply. All the clinical thermometers branded ZEAL conform to both BS and EC Specifications, they also carry the CE Mark of Approval – CE 0086.

There are different types of instruments produced, for oral/axilla or rectal use incorporating either a ‘standard or subnormal’ range together with an ‘ovulation or fertility’ thermometer, for either ‘conception or contraception’ purposes (not included in this CD ROM). By far the most common type is for oral and axillary use that incorporates a short ‘stubby’ bulb, alternatively for rectal use when the instrument will be identified, for hygienic reasons, with either a blue bulb of a blue ‘ball’ top.

**Instructions for Use – Oral site.**

1. Remove carefully from outer case and clean in cold soapy water if there is no mild disinfectant available. Under no circumstances whatsoever is either ‘hot or boiling’ water to be used since this will ‘burst’ the mercury sensor.
2. Check that the magnified image of the ‘mercury column’ is below 36°C (96°F) on the graduated scale, if not, reset the ‘mercury column’ by repeated ‘upward/downward flicks of the wrist’ until in these positions.
3. Place the ‘bulb end’ of the thermometer under the patient’s tongue, see illustration(s) patient to close mouth firmly and at the same time press their tongue down onto the thermometer in their mouth. **Use of the Oral site is not recommended for children/infants under the age of 10 years.** Leave in position for a minimum of at least 3 minutes. Failure to leave in situ for this period may result in an inaccurate (lower) reading, leaving it longer will have no detrimental effect. It is important that the patient does not talk or open their mouth throughout the time the thermometer is inserted and breathe normally through their nose. Failure to follow this simple procedure can also result in an inaccurate reading or the breakage of the thermometer.
4. Just prior to removing the thermometer, ask the patient to release their tongue from holding it securely, then gently withdraw it from the patient’s mouth.
5. Read off the temperature to the nearest graduation and record it on the patient’s temperature chart.
6. Reset the ‘mercury column’ to below 35°C (96°F), clean the thermometer as in item 1, prior to replacing it into the outer case.

**Instructions for Use – Axilla site.** Recommended for children under the age of 10 years and elderly care patients.

1. Remove carefully from outer case and clean in cold soapy water if there is no mild disinfectant available. Under no circumstances whatsoever is either ‘hot or boiling’ water to be used since this will ‘burst’ the mercury sensor.
2. Check that the magnified image of the mercury column is below 36°C (96°F) on the graduated scale, if not, reset the ‘mercury column’ by repeated ‘upward/downward flicks of the wrist’ until in these positions.
3. Raise patient’s arm and place the ‘bulb end’ of the thermometer into the centre of either axilla (arm-pit) against the skin (not on any clothing) as high as it is possible, see illustrations (sitting & lying down) lower the patient’s arm to side with hand across chest. Leave in situ for at least 5 minutes. It may be necessary to hold the thermometer in place where children are having their temperatures taken.
4. Just prior to removing the thermometer, ask the patient to release their arm from holding it securely in their axilla.
5. Read off the temperature to the nearest graduation and record it on the patient’s temperature chart.
6. Reset the ‘mercury column’ to below 35°C (96°F), clean the thermometer as in item 1, prior to replacing it into the outer case.
It should be carefully noted that temperatures taken with the glass/mercury thermometer using the axilla site can read lower by at least 1.0°C by comparison to the Oral site; the reason is due to the round shape of the mercury ‘bulb end’ of the thermometer that cannot be in full contact with the flat surface of the axilla.

Instructions For Use – Rectal site; Adults Only (14). Not recommended for the newborn and children generally, unless the other sites are not available and then only with extreme care by a Doctor or fully qualified Nurse.

1. Carefully remove from outer case and clean in cold soapy water if there is no mild disinfectant available. Under no circumstances whatsoever is either ‘hot or boiling’ water to be used since this will ‘burst’ the mercury sensor.
2. Check that the magnified image of the mercury column is below 36°C (96°F) on the graduated scale, if not, reset the ‘mercury column’ by repeated ‘upward/downward’ flicks of the wrist until in these positions.
3. Surgical gloves should always be used, subject to availability, whenever taking rectal temperatures.
4. Position the patient on either side, lying down on a bed with knees bent and exposing their undressed rear end. Illustration.
5. Lubricate at least 30mm (1.25”) of the ‘bulb end’ of the thermometer with petroleum jelly or similar.
6. Slowly and gently insert no more than 25mm of the lubricated ‘bulb end’ of the thermometer through the anal canal and into the rectum. Illustration. Great care is required to ensure the ‘bulb end’ of the thermometer follows the direction of the anal canal and does not perforate the anal wall. Leave in situ for at least 2 minutes.
7. Remove slowly and carefully, wipe clean the lower ‘bulb end’ of the thermometer, read-off the temperature to the nearest graduation and record it on the patient’s temperature chart.
8. Clean the thermometer initially in soapy cold water before soaking in disinfectant for at least an hour before returning it to within the outer case. Remove and discard the surgical gloves, wash hands thoroughly in hot soapy water.

The Rectum is recognised as the most reliable and accessible site to record deep core body temperature (6, 7, 8) but invasive for the patient. When selected for infants and children it can be considered as ‘an assault’ upon them since they are unable to refuse the procedure and elect for an axillary taken temperature instead. Furthermore, where re-usable devices are involved there are always the problems of personal hygiene, disinfecting the thermometer and keeping it quite separate from use either orally or in an axilla.
ii) **Subnormal (Low) Range 25/40°C. To identify ‘the state of hypothermia’. (15, 16)**

*For Oral, Axillary & Rectal Use.*

Accuracy Tolerance. ±0.3°C

(There is no Fahrenheit equivalent).

**CE Registration No: 0086.**

**Illustration**

Hypothermia is defined as a body temperature of less than 35°C. It occurs when the core temperature falls and heat loss exceeds the body’s ability to generate heat. The incidence of hypothermia can affect both the very young and the elderly, it can also be a consequence of exposure in low ambient temperatures and through immersion in cold water. It is generally recognised that there are three stages of hypothermia;

**Mild (Cold Stress) – 36.5° to 32°C**

**Moderate – 32° to 30°C**

**Severe – 30°C and below.**

![Thermometer Illustration](image)

The availability of subnormal (low) range clinical thermometers outside the ‘developed world’ are difficult to obtain, but **GHZeal Ltd.** (details in item 1 above) who were involved with The British Medical Association with the design and manufacture of this special instrument in the early 1960’s, are a potential supply source despite the general demise of the glass/mercury clinical thermometer.

The inclusion of this subnormal (low) range clinical thermometer on this CD ROM concerns especially the essential need for the thermal protection of the newborn (28). The newborn cannot regulate its temperature as well as an adult and therefore needs to be protected from the cold even in a tropical climate. In the absence of a simple alternative to this subnormal clinical thermometer hitherto (see item 3), it is hardly surprising that little or no understanding is given to the serious problem of neonatal hypothermia. (See item 3 ThermoSpot))

The purchase and reliable use of the subnormal (low) range clinical thermometer in the hot ambient temperatures experienced in tropical climates requires a different and somewhat more complicated set of ‘instructions for use’, these are outlined below.
Instructions for Use.

1. Remove the thermometer carefully from outer case and clean in only cold soapy water if there is no mild disinfectant available. Under no circumstances whatsoever should either ‘hot or boiling’ water be used since this will burst the mercury sensor.

2. Check that the magnified image of the ‘mercury column’ is below 26°C on the graduated scale. If the prevailing ambient temperature is above 26°C then this can only be achieved by immersing the ‘mercury sensor’ end of the thermometer into a container of cold water for several minutes prior to resetting the ‘mercury column’ by repeated ‘upward/downward flicks of the wrist’ until in this position. It may prove necessary in very high ambient temperature conditions to immerse the ‘mercury sensor’ several times before correctly resetting the ‘mercury column’ below 26°C. Once reset in this position it is essential for the thermometer to remain in the container of cold water.

3. **Oral site.** Place the ‘bulb end’ of the thermometer under the patient’s tongue, see illustration(s) patient to close mouth firmly and at the same time press their tongue down onto the thermometer in their mouth. **Use of the Oral site is not recommended for children/infants under the age of 10 years.** Leave in position for a minimum of at least 3 minutes. Failure to leave in situ for this period may result in an inaccurate (lower) reading, leaving it longer will have no detrimental effect. It is important that the patient does not talk or open their mouth throughout the time the thermometer is inserted and breathes normally through their nose. Failure to follow this simple procedure can also result in an inaccurate reading or the breakage of the thermometer.

4. **Axilla site.** Recommended for children under the age of 10 years and elderly care patients. Raise patient’s arm and place the ‘bulb end’ of the thermometer into the centre of either axilla (arm-pit) against the skin (not on any clothing) as high as possible, see illustrations (sitting & lying down) lower the patient’s arm to side with hand across chest. Leave in situ for at least 5 minutes. It may be necessary to hold the thermometer in place where children are having their temperature taken.

5. **Rectal site.** Adults Only. **Not recommended for the newborn and children generally, however, should the patient feel cold to touch and appear sluggish, this site may be the only one to obtain a reading. Extreme care should be taken and then by a Doctor or fully qualified Nurse.** Surgical gloves should always be used, subject to availability, when ever taking rectal temperatures. Position the patient on either side, lying down on a bed with knees bent and exposing their undressed rear end. **Illustration.** Lubricate at least 30mm (1:25”) of the ‘bulb end’ of the thermometer with petroleum jelly or similar. Slowly and gently insert the lubricated ‘bulb end’ of the thermometer through the anal canal and into the rectum. The insertion depth will depend upon the age and size of the patient. Great care is required to ensure that the ‘bulb end’ of the thermometer follows the direction of the anal canal and does not perforate the anal wall. Leave in situ for at least 2 minutes.

6. Remove slowly and carefully, wipe clean the ‘lower end’ of the thermometer, read off the temperature to the nearest graduation and record it on the patient’s temperature chart.

7. Clean the thermometer initially in soapy water before soaking in disinfectant for at least an hour, it should then be returned into the outer case. Remove and discard the surgical gloves, wash hands thoroughly in hot soapy water.
Mercury. (17, 18, 19).

The conventional glass/mercury clinical thermometer has been in continuous use throughout the world since it was first introduced in 1866/1867, clearly it has served the Medical & Nursing professions and Patients generally very well. However, with the advent of greater knowledge and growing concerns for the environment, its use in the future is already in steady decline, especially in the UK, Europe and North America. Legislation exists in a number of countries, Denmark, Sweden, Norway and France to ban the use of all mercury and mercury based products. There are also increasing anxieties about the costs of ‘hospital acquired infections’ (HAI) and the risks of spreading bacterial diseases such as MRSA and VRE for which there appears no immediate antibiotic treatment. It will take some years for the conventional glass/mercury thermometer to disappear altogether and for a suitable replacement(s) to become established but various alternatives are already emerging, some of which are included in this CD ROM. The importance of thoroughly cleansing re-usable types of clinical thermometers with recognised disinfectants between patients cannot be stressed enough.

Precautions in the handling of mercury.

Mercury is both poisonous (toxic) and corrosive! When a glass/mercury thermometer gets broken (illustration) there is a strong risk for loose mercury to be spilt on the floor where the accident occurs, it is essential for any mercury to be carefully collected and stored under water in an unbreakable container (illustration). The use of surgical gloves and even a facemask are important when clearing up from a thermometer breakage since, if handled, mercury will be absorbed into the bloodstream through skin and even attack a gold wedding ring. The fumes from unprotected/spilt mercury are also very dangerous, especially in high ambient temperature environments when this risk is at its highest. Following a mercury spill it is important to thoroughly ventilate the area where this has occurred. Mercury by its nature is both difficult to locate on a floor and then to pick up. The most satisfactory method is by using a soft hand-brush and sweeping the mercury into a dustpan. Under no circumstances whatsoever is a Vacuum Cleaner to be used since mercury will corrode the aluminium components inside and but also blow-out warm air contaminated with mercury fumes, these are potentially very harmful indeed. Loose mercury should never be flushed down a toilet nor thrown on a fire alternatively onto waste ground where eventually it will contaminate water supplies. The most responsible procedure is to take it within an unbreakable container immersed in water to The Pathology Department of a local hospital where it may be possible to dispose it chemically. Broken pieces of glass from the thermometer can be thrown away provided they do not contain any mercury.

Important Warning.

Glass/mercury clinical thermometers, or in fact any type of ‘mercury’ thermometer are identified as a hazardous or dangerous cargo by IATA (International Air Transport Association) whenever these instruments are flown on board any type of aircraft (passenger or transport). Under no circumstances should they be included in passenger’s baggage or handbags and if found by Security Staff or Security (x-ray) checks will immediately be confiscated. This ‘warning’ is included in all Air Tickets throughout every civil aviation Airline and represents one of the very few items not allowed on board any aircraft. The reason is simply that there has been one known fatal air accident (in 1952) due to mercury attacking the materials used in making aeroplanes.

Further information from;
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E-mail: scientific@zeal.co.uk
Website: www.zeal.co.uk
Please quote Ref: JZ/CC
2. The ZEAL Single-Use Thermometer.  
(For Oral & Axillary use)  
Accuracy tolerance ±0:1°C  
CE Registration No: 0086.

The ZEAL Single-Use Thermometer (20, 21) represents a quite new approach to accurately measuring body temperature by incorporating liquid crystal technology that does not require either the traditional materials of glass or mercury as for the conventional instrument. It is therefore entirely safe and ideal for children in being neither breakable nor toxic, easy to read and use, it can also be quickly re-set following use or activated by high ambient temperatures during transport. It was originally designed as ‘a single-use’ thermometer to overcome the risks of cross/re-infection and to avoid the essential procedures of cleansing between each patient use that are both time consuming and expensive. However, it can be re-used quite safely providing a few simple procedures are followed. The life of this device can be extended provided it is stored in the dark when not in use, owing to the effects of ultra-violet rays that are particularly strong in tropical areas of the world. It is essential to cleanse the device after each temperature is taken to prevent the serious risk of both cross/re-infection using a mild disinfectant solution and cotton wool.

Instructions for Use – Oral.

Place the dot-matrix scale area (sensor) of the thermometer downwards into a sublingual pocket under the patient’s tongue, either side and as far towards the back as possible. Leave in this position with mouth firmly closed for at least 1 minute. The patient should press down their tongue onto the thermometer. It is quite possible and safe for a child of say 5/6 years old to use this device orally with supervision.

Instructions for Use – Axilla.

Place the dot-matrix area (sensor) of the thermometer facing inwards to the torso, as high as possible, into the axilla (either arm). Lower patient’s arm with the hand across their chest. If the patient is unable for any reason to keep the thermometer in situ secure with medical tape. Leave in this position for a minimum of 3 minutes.

It is worth pointing out that the ZEAL single-use thermometer in the axilla will more accurately reflect a patient’s temperature than the conventional
glass/mercury instrument. The reason is simply due to the different shapes of the sensors, one is round the other is flat. When the round sensor of the glass/mercury thermometer is placed into an axilla, only a small section of the surface area of it is in contact with the skin so the transfer of body heat can never be accurately recorded. This is the cause of the conventional glass/mercury thermometer recording lower readings in the axilla than in the oral cavity and why the insertion time of at least 5 minutes is so important. However, the flat sensor of the ZEAL single-use thermometer can be positioned into the axilla, dot matrix area against from where the transfer of body temperature will be accurately recorded due to the two flat surfaces being in proper contact with each other.

Remove the thermometer from the site selected after the appropriate insertion period and read the temperature indicated by the last ‘black dot’ immediately. Alternatively, select the lowest ‘green dot’ and subtract 0.1°C. Those ‘dots’ that have changed colour to ‘black’ will begin to revert back to ‘green’ after some 20 seconds so it is essential to identify the indicated temperature within this period. The process of re-establishing all the ‘green dots’ can be speeded up by rubbing the dot matrix area energetically between a finger & thumb, this procedure may also be necessary when ambient temperatures are high (above 35°C) and cause the dots to change colour prior to use. This procedure can be speeded up with the aid of some cold water.

A colourful educational poster illustrating the instructions for use is available upon request.

Available from;
TALC (Teaching-aids At Low Cost).
P O Box 49.
St. Albans.
Herts. AL1 5TX . UK.
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E-mail: talc@talcuk.org
Website: www.talcuk.org

3. **ThermoSpot – Non-invasive hypothermia indicator.**
   (For Axillary, Hypochondrium & Supraclavicular Fossa use).
   Accuracy tolerance ±0.5°C
   CE Registration No: 0434.

**Assisting Mothers and Health Workers to Recognise Hypothermia (22).**

**Introduction.**

Hypothermia (<35.5°C) in the newborn and particularly the Low Birth Weight baby is a worldwide problem. Research shows that the importance and recognition of it’s frequency in ‘developing countries’ is not acknowledged even by paediatricians (23). UK studies in the past show that, after low birth weight, the occurrence of hypothermia correlated with subsequent death of the infant more strongly than any other factor (24).

In the first 20 minutes of life after birth the newborn’s temperature may fall 2-4°C and continue to fall unless the infant is adequately dried and wrapped with the head covered. These changes can only be recognised with a glass and mercury low reading clinical thermometer, these are rarely available in ‘developing countries’, even in hospitals. The use of the glass and mercury clinical thermometer is likely to be discontinued in many countries over the next five years and no simple alternative is available.

The ThermoSpot is a simple, low cost and safe device easily understood by mothers and health workers. It is a 12mm diameter plastic disc with a sticky back. It can be placed either high in the axilla, over the liver (hypochondrium), or possibly over the great vessels of the neck in the supraclavicular fossa (currently under investigation). As long as the infant’s temperature is below <35.5°C the black disc does not change, above >36.5°C a bright green face will appear. It is likely to stay in position for a week or more. It can be reapplied with clear surgical tape after cleaning.
Early trials (25) suggest that it is popular with both mothers and staff and may well reduce expenditure and anxiety to mothers by preventing the need to admit infants to a special (neonatal) care unit.

All Black indicating ‘hypothermia’.  
(<35:5°C)

Bright Green Background indicating ‘the safe zone’  
(36:5° to 37:5°C)

To demonstrate how ThermoSpot functions use a plastic drinking ‘glass’ or the lower half of a plastic bottle. Place a ThermoSpot about half way up on the outside then fill to this level with cold water. Add boiling water from a kettle very slowly until the black disc changes colour to a ‘bright green’ background with a ‘smiling face’ appears. 

Illustration To see the ‘sensitivity’ of ThermoSpot, tilt the container of water away from the disc; the ‘smiling face’ and ‘bright green background will very quickly disappear and return to black. 

Illustration In actual use the colour change will be much slower with variations in body temperature.

Instructions for Use

1. Instruct the mother on the importance of maintaining her baby’s body temperature within the safe zone (36:5° to 37:5°C).
2. Place ThermoSpot in the axilla (under the arm), alternatively in the hypochondrium or over the great vessels of the neck (supraclavicular fossa) illustrations It is advisable to clean the site selected beforehand using an alcohol swab.
3. Remove a ThermoSpot ‘disc’ from the backing strip and press firmly into the selected site, white ‘dots’ upright.
4. Provided the newborn’s body temperature is within the safe zone a ‘smiling face’ Illustration will appear on a ‘bright green background’ (Not a pale green background that first appears). It is recommended that observations occur every two hours. Mothers should seek advice if the ‘smiling face’ begins to fade or reverts to black.
5. ThermoSpot normally remains attached to the skin for at least a week, should the disc become dislodged a fresh ‘Spot’ is recommended or it can be reattached using a strip of transparent medical tape.

- Hypothermia in newborns, particularly the Low Birth Weight Baby (LBW) is a common occurrence and widely overlooked (27). It occurs in both hospitals and in the community (28).
- The ThermoSpot is a simple device for use by mothers, nurses and TBA’s.
- Management of hypothermia involves covering the head and placing the infant in close body contact with the mother or carer. This method of treatment is more effective than the use of incubators (29).

Available from;
TALC (Teaching-aids At Low Cost).
P O Box 49.
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E-Mail: talcuk@btinternet.com
Website: www.talcut.org

(For Oral & Axillary use).
Range: 28:0° to 42:9°C
Accuracy: ±0:1°C between 35:5° and 42:9°C
±0:2°C below 35:5°C in an ambient temperature of 18° and 28°C.
CE Registration No: 0118.

Introduction.

Pocket ‘digital’ thermometers is one of several different types of electronic devices using micro chip technology, they are usually quite small, well made instruments and are manufactured in either South Korea, China(free zone) or Taiwan. They use very small ‘long-life’ batteries of a type usually found in hearing-aids or clocks but they do not last indefinitely, they are expensive to purchase, not always readily available when a replacement is required and have been known to be swallowed by small children. It it essential therefore that this instrument is stored away carefully well out of the reach of children when not in use. The battery type used in this model is: 1.55 VDC V type LR 41, AG3 or similar. Some models claim to be ‘waterproof’ and may also include a ‘memory function’ recalling the previous recorded temperature, a few brands even incorporate a ‘solar cell’ to avoid the problems associated with replacing the battery which represents another useful facility.

Pocket ‘digital’ thermometers can be useful, modern alternatives to other types of clinical thermometers available since they are small and not governed by International Air Transport Association (IATA) Regulations, they can easily be carried in a pocket or handbag if required by a traveller. However, they are expensive to purchase from a retail Pharmacy by comparison to other alternatives and ‘instructions for use’ are usually provided though sometimes quite difficult to read. These ‘instructions for use’ should always be carefully read before using the device.

Generally speaking they are as accurate in use as the conventional glass/mercury clinical thermometer but much safer from breakage by being made with a strong plastic outer body, furthermore, they can withstand a certain amount of rough treatment without damage. However, as with all ‘electronic’ devices they can develop a fault or become inaccurate without the user being aware that a problem has occurred. This particular type of electronic thermometer for body temperature measurement use still requires careful cleansing throughout between patient use with a recognised disinfectant soaked onto a cotton wool swab, alternatively, the stem and lower probe can be immersed in a liquid containing a disinfectant for up to 30 minutes. Under no circumstances should either boiling or hot water be used to clean this type of thermometer since it will be ‘over-ranged’ and subsequently malfunction. The outer case, both in and outside, should also be regularly cleansed in a similar manner.
Instructions for use.

Turning on the thermometer.

1. Push the button adjacent to the display window, a short signalling tone (beep) indicates the thermometer is ‘ON’. A display ‘test’ then follows with 188.8°C briefly appearing then ‘ok’, the thermometer is now ready for use.
2. At every occasion the thermometer is turned ‘on’ it automatically carries out a ‘function test’. Should the thermometer malfunction the letters ‘Err’ will appear in the window display. If measurement of a temperature cannot occur, the thermometer should be replaced.
3. Whenever using this thermometer, the current temperature is displayed with the ‘°C’ symbol flashing continuously. Once the ‘°C’ symbol ceases to flash the maximum temperature has been reached and the thermometer can be removed for reading. To prolong the battery life it is advisable to turn-off the thermometer by pressing the button immediately after recording the temperature; should it be left-on accidently the device will switch itself off automatically after some 8 minutes. To recall the last temperature recorded, press the button for more than 3 seconds, at the same time a small ‘m’ will appear in the right side of the display – continue to press the button and the memory function will disappear after another 3 seconds. This memory function will always recall the last temperature recorded.

4 i). Oral Use.
Place the sensor (silver end) into one of the two pockets under the tongue, press the tongue firmly down onto the sensor and close mouth, leave in situ for at least one minute. Providing the ‘°C’ symbol has ceased to flash, remove the thermometer and record the reading. Owing to the similar shapes of ‘pocket electronic digital thermometers’ it may be necessary to hold the end of the thermometer whilst inserted in the oral cavity so as to make it more comfortable and prevent the device slipping from under the tongue.  

4.ii) Axillary Use.
Place the sensor as high and as deep as possible into the arm-pit so that the LC display is visible, fold the arm across the chest and leave in situ for at least 5 minutes. Providing the ‘°C’ symbol has cease to flash, remove the thermometer and record reading. Illustration (As with the conventional glass/mercury clinical thermometer the shape of the sensor for the Pocket Electronic Digital is similar so temperatures recorded in this site will be less accurate, usually lower, for exactly the same reason. See Item 2: Instructions for Use – Axilla).

4. It is NOT recommended that this device is used rectally.

5. Following use always cleanse the thermometer in accordance with the recommendations within the Introduction paragraphs above. When not required it is advised to keep the thermometer within the outer case provided and in a safe place well out of the reach of children.

Replacing the battery.

The life of the battery will largely depend upon the number of occasions the thermometer is used and provided it is stored in within the temperature span of -20°C to +55°C. When the battery requires replacing a “battery illustration” symbol will be featured in the LC display area. Remove the battery compartment lid, remove the exhausted battery, replace with a new one(1.55 V Type LR 41, AG3 or similar) positioning the ‘+’ sign’ at the top. Replace the battery lid. It is essential that the exhausted battery is discarded responsibly and where children cannot gain access, there have been cases where these small batteries are swallowed mistaken as sweets.

Warranty.

It is usual for the manufacturer to provide a 2 year warranty against defects and the terms and conditions are likely to be included within the Safety Instructions for Use of the thermometer, these should be carefully read and retained for possible future use.

References.